

Agency: Commerce, Community and Economic Development**Grants to Municipalities (AS 37.05.315)****Grant Recipient: North Slope Borough****Project Title:**

North Slope Borough - Wainwright Coal Bed Methane Project

State Funding Requested: \$ 850,000**House District: 40 - T**

Future Funding May Be Requested

Brief Project Description:

Project will complete phase two of coal bed methane alternative energy development for the village of Wainwright and validation of technology for rural village application.

Funding Plan:**Total Cost of Project: \$2,300,000**

	<u>Funding Secured</u>		<u>Other Pending Requests</u>		<u>Anticipated Future Need</u>	
	<i>Amount</i>	<i>FY</i>	<i>Amount</i>	<i>FY</i>	<i>Amount</i>	<i>FY</i>
Federal Funds	\$600,000	FY 09				
Local Funds	\$850,000	FY 09				
Total	\$1,450,000					

Detailed Project Description and Justification:

See attached description

Project Timeline:

\$1,700,000 FY 09 Validation of coal bed methane resources for rural village alternative energy application.

Entity Responsible for the Ongoing Operation and Maintenance of this Project:

North Slope Borough

Grant Recipient Contact Information:

Contact Name: Matt Dunn, North Slope Borough

Phone Number: (907) 852-0489

Address: P.O Box 69, Barrow, Ak 99723

Email: matt.dunn@north-slope.org

Has this project been through a public review process at the local level and is it a community priority? ☐ Yes ☒ No



WAINWRIGHT COAL BED METHANE PROJECT Phase II 2008

A Collaborative Agreement

Between the

UNITED STATES GEOLOGICAL SURVEY

&

NORTH SLOPE BOROUGH, BARROW, ALASKA

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Collaborative Agreement

Agreement between U.S. Geological Survey, a Bureau of the Department of the Interior, through the offices of its Central Region research Drilling Project, hereinafter called "USGS"; and The North Slope Borough, a County Governmental Unit within the state of Alaska hereinafter called "NSB".

Whereas, the USGS is authorized to perform collaborative work and prosecute projects in cooperation with other agencies, Federal, State or private, pursuant to 43 USC 36c, and the NSB is authorized to make contracts with local governments, the states, the United States or any agency or instrumentality of these governments pursuant to NSBMC §2.36.180(A)(1)(g); and

Whereas the USGS and the Bureau of Land Management (BLM) have previously partnered with the Arctic Slope Regional Corporation (ASRC) and the NSB on studies identifying and assessing coal bed gas or other shallow subsurface resources on or near rural Native villages and on Federal lands in rural Alaska; and

Whereas these recent USGS studies have indicated the existence of undiscovered resources of coal bed gas that may offer a cost effective local energy source for NSB communities; and

Whereas, NSB is committed in taking the next step in the assessment process, that of drilling and conducting a multiple-well production test in Wainwright, Alaska in order to meet an NSB mission objective of establishing cost effective alternative energy sources to provide electrical power generation to the North Slope villages; and

Whereas, ASRC will be responsible for permitting; and

Whereas, the NSB will be actively pursuing the right to develop and produce, thus affording the residents in the area with electrical power generation provided by the NSB and employment opportunities.

Now therefore, the parties hereto agree as enumerated in the following articles:

1. **Statement of work:** The work to be performed under this Statement of Work, will be conducted by the parties on a best efforts basis.

Background/Purpose

In accordance with ongoing efforts by the U.S. Department of the Interior (DOI) Alaska Rural Energy Project, the USGS and the BLM, in partnership with the ASRC and the NSB, conducted initial exploratory drilling and testing activities in the village of Wainwright, AK during the summer of 2007 (Phase I) to assess whether methane gas contained within coal seams underlying the community might serve as an alternative energy source for the community. Having collected and desorbed coal cores for gas content from the 2007 drilling and testing effort, it is evident that sub-

permafrost coal seams underlying Wainwright contain adequate methane gas to potentially serve as a long-term energy source for the community.

The 2008 Phase II drilling effort is designed to provide, to as great an extent as possible, the data necessary to verify the continuity of the resource, to establish well field production parameters, and to determine whether the resource can be produced in an economically viable and environmentally sound manner. This will be done by drilling and setting an array of production and monitor wells (see attached diagram) and conducting a short-term production test from which reservoir data will be gathered. Additionally, a minimum of one deep (2500-3000 ft) exploratory well will be drilled at a distance of >1 mile from the 2007 borehole to determine the lateral continuity of coal seams, to search for deeper coal seams, and to study stratigraphic features such as thick sandstone beds that might ultimately serve as reinjection zones for produced coal bed waters.

The goal of the effort is to assess shallow subsurface energy resources in the area, which is part of the USGS domestic mission, and to identify economically viable and environmentally sound alternative energy resources for Native communities in rural Alaska. This is also a primary goal of the NSB.

The NSB has committed funding to support the installation of a production test well array and has requested the assistance of USGS and BLM in accomplishing this objective in Wainwright, AK.

2. **Principal Contacts:** The Principal Investigator assigned to this project from the USGS is Arthur Clark, 303-236-5793; aclark@usgs.gov. The Principal Contact for the NSB is Matt Dunn, 907-852-0489; matt.dunn@north-slope.org.
3. **Term:** The term of the agreement is from March 1, 2008 until September 20, 2012. This agreement will be conducted in phases. Phase II of the effort will begin in March 2008 and end in September 2008. If successful, if funding is available, and if agreed to by both parties, other similar research projects will be undertaken under this agreement. This agreement is subject to renewal only by mutual written agreement of the parties.
4. **Title to Equipment:** Each party shall retain title to any/all equipment used by it during the completion of the tasks identified in the statement of Work unless the Parties have negotiated other terms. At the conclusion of the drilling project, any well not decommissioned by mutual agreement and in accordance with Alaska Oil and Gas Conservation Commission (AOGCC) regulations, will become the property of NSB or its designee; and NSB assumes all responsibility for operating and eventually closing the well location, with ASRC responsible for obtaining all necessary permits. After a well is turned over to NSB by USGS, NSB becomes liable for activities conducted at the site.

5. **Funding:** The NSB is funding an amount not to exceed One Million Seven Hundred thousand Dollars (\$1,700,000), less the NSB administration fee of \$170,000 which is a Not to Exceed of \$1,530,000, for the drilling and testing efforts outlined as Phase II in the Statement of Work. USGS will require a Mobilization Fee of \$500,000 to purchase the needed drilling supplies and to transport equipment and supplies from Deadhorse to Wainwright, Alaska. USGS will invoice for the Mobilization Fee upon execution of the Agreement. Thereafter USGS will invoice NSB on a monthly basis at the address of the administrative contact listed in Article 10. Obligated NSB funds not utilized during Phase II efforts can be deobligated by the NSB or left in the agreement as no-year-funds to be used for future project efforts as agreed to by both parties.
6. **Reimbursement of costs:** The USGS will charge the NSB for all drilling-related services as outlined in the provided cost summary estimate. The document is to be used for estimate purposes only and does not represent a legal or binding quote by the USGS for services rendered. Final charges to the NSB will be determined by the total hours worked by USGS drill crew personnel, the reimbursable services and supplies provided, and all applicable assessment charges. Final project charges will not exceed the funds obligated to the project by the NSB. Itemized invoices of project charges will be provided to the NSB at a minimum of every 30 days. Submit all invoices to the CIPM Project Administrator. All invoices shall be attached to a NSB Invoicing Format and shall contain all necessary backup documentation.

USGS and BLM are contributing equipment and research effort valued at approximately \$600,000.00 for Phase II activities.

The ability of the parties to carry out their responsibilities under the Agreement is subject to their respective funding procedures and the availability of appropriated funds. Should either party encounter budgetary problems in the course of the project, they agree to notify the other party in writing in a timely manner.
7. **Timeline:** Drilling and testing activities are to be conducted in Wainwright from early-June through mid-August 2008, with final invoicing by September 15, 2008.
8. **Termination:** This Agreement may be terminated by either party on 30 days written notice to the other party. In the event of an early termination USGS shall be reimbursed for any completed work or work in progress that cannot be cancelled at the time of termination of the agreement. This provision shall survive the termination of the agreement.
9. **Publication/Reports:** The purpose of this agreement is to identify and assess local sources of methane gas or other shallow subsurface resources as part of the Department of Interior Alaska rural Energy Project. Information will be shared with project partners as it is gathered and as requested. Each Party is free to utilize the information developed by the drilling and testing effort in reports and

databases utilized by federal, state and local authorities. USGS will supply the information to its real-time websites and provide an open file report at the conclusion of the research effort. The final report will include deliverables indicated in Exhibit C of this Collaborative Agreement and will be provided to the NSB in both electronic and CD format.

10. **Notices:** Any notice required to be given or which shall be given under this Agreement shall be in writing and delivered by first class mail to the parties as follows:

USGS:
Arthur Clark – Technical
Supervisory Physical Scientist
USGS DFC Box 25046, MS 939
Denver, CO 80225
Ph: 303-236-5793
Fax: 303-236-5448
E-mail: aclark@usgs.gov

Diana Richards - Administrative
USGS Box 25046 DFC MS911
Denver, CO 80225

Ph: 303-236-5430
Fax: 303-236-5448
E-mail: dianalr@usgs.gov

NSB:
Matthew Dunn – Public Works
CIPM Division Manager
PO Box 350
Barrow, AK 99723
Ph: 907-852-0489
Fax: 907-852-0257
E-mail: matt.dunn@north-slope.org

Dave Merrill – Project Administrator
NSB Department of Public Works
CIPM Division
PO Box 350
Barrow, AK 99723
Ph: 907-854-0489 ext. 478
Fax: 907-852-0257
E-mail: david.Merrill@north-slope.org

11. **Independent Entity:** For purposes of this Agreement and all services to be provided hereunder, each party shall be, and shall be deemed to be, and independent party and not an agent or employee of the other party. Each party shall have exclusive control over its employees in the performance of the work. Neither party may use the name of the other in advertising or other form of publicity without the written permission of the other.

12. **Governing Law/Disclaimer:**

a) The validity and interpretation of this Agreement are subject to interpretation under Federal Law. Each party agrees to be responsible for the activities, including the negligence of their employees or agents. As a federal agency, USGS liability is limited by the Federal Tort claims Act. USGS warrants that it is self-insured for purposes of Worker's Compensation.

b) **THE USGS AND NSB MAKE NO EXPRESS OR IMPLIED WARRANTY AS TO THE CONDITIONS OF THE RESEARCH, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE RESEARCH, DATA OR RESULTING PRODUCT INCORPORATING**

DATA DEVELOPED AND EXCHANGED UNDER THE STATEMENT OF WORK. THESE PROVISIONS SHALL SURVIVE THE TERMINATION OF THE COLLABORATIVE ASSISTANCE.

13. **Entire Agreement:** This Agreement contains all of the terms of the parties and supersedes all prior agreements and understandings related thereto. This Agreement can be changed or amended only by a written instrument signed by the parties.
14. **Disputes:** The signatories to this Agreement shall expend their best efforts to amicably resolve any dispute that may arise under this Agreement. Any dispute that the signatories are unable to resolve shall be submitted to the Director or designee of the USGS and the NSB Mayor or his designee for resolution.
15. **Exhibits:** Exhibit A: USGS Cost Estimate, Exhibit B: Schedule of Values and Exhibit C: Report Deliverables, are incorporated into this Collaborative Agreement by reference.
16. **Miscellaneous Provisions:** Pursuant to the Ant-Deficiency Act, 31 U.S.C. § 1341(a)(1), nothing herein contained shall be construed as binding the USGS to expend in any one fiscal year any sum in excess of its appropriations or funding in excess or what it has received for the collaborative work outlined in the Statement of Work.

IN WITNESS WHEREOF, the parties have caused this agreement to be executed the last date listed below.

U.S. GEOLOGICAL SURVEY

NORTH SLOPE BOROUGH

By: _____
Randall G. Updike

By: _____
Edward S. Itta, Mayor

Title: _____
Regional Executive for the
Rocky Mountain Area

Title: _____
Mayor

Date: _____

Date: _____

EXHIBIT A

Wainwright Coal Bed Methane Project 2008 Phase II

USGS Cost Estimate

Estimated 2008 Alaska CBM Production Project Costs: Wainwright Option 3: Exploration well, Central Production well, 5 monitor wells

Air transport of equip from Deadhorse to Wainwright

Item	weight	# loads	cost
Drill Rig	45,000	1	\$ 30,000.00
Drill Rig mast plus assorted items	40,000	1	\$ 30,000.00
Drill steel and trailer	40,000	1	\$ 30,000.00
Casing, antifreeze, cement, mud, grout, etc.	0	5	\$ 150,000.00
		8	\$ 240,000.00

DRILLING OF "EXPLORATION" WELL NEAR LANDFILL

Item	Hours	Cost
Unpack equipment from winter storage	48	\$ 19,200.00
General site preparation	24	\$ 9,600.00
Drill, set, and cement 7 5/8" conductor casing to 70 feet	18	\$ 7,200.00
Drill 6 3/4" rotary hole to 3000 feet - no core taken	120	\$ 48,000.00
Run geophysical logs	12	\$ 4,800.00
Abandon well	24	\$ 9,600.00
Pack and move equipment to production well site	24	\$ 9,600.00
	270	\$ 108,000.00

DRILLING OF CENTRAL PRODUCTION WELL

Item	Hours	Cost
General site preparation	24	\$ 9,600.00
Equipment setup	12	\$ 4,800.00
Drill, set, and cement 12" conductor casing to 70 feet	18	\$ 7,200.00
Drill 12" hole to 1240 feet (top of coal seam)	72	\$ 28,800.00
Set and cement 1240 feet of 7 5/8" steel casing	24	\$ 9,600.00
Trip steel inside casing and drill 6 3/4" hole to 1270 feet	12	\$ 4,800.00
Develop well for testing	24	\$ 9,600.00
Set pump, fill well with antifreeze, install transducers, etc	24	\$ 9,600.00
Conduct step-drawdown and recovery testing	168	\$ 67,200.00
Pull pump and equipment, decommission well	24	\$ 9,600.00
		7 day pump test

Pack and clean equipment: Prepare equipment for barge	24	\$	9,600.00
	426	\$	170,400.00

DRILLING OF MONITOR WELLS

Item	Hours	Cost
General site preparation - equipment setup	8	\$ 3,200.00
Drill, set, and cement 7 5/8" conductor casing to 70 feet	18	\$ 7,200.00
Drill 6 3/4" rotary hole to 1270 feet	36	\$ 14,400.00
Run geophysical logs	2	\$ 800.00
Set and complete 2.5" PVC monitor well	24	\$ 9,600.00
Develop well and fill with antifreeze	12	\$ 4,800.00
Pack and move equipment	8	\$ 3,200.00
	108	\$ 43,200.00
Number of monitor well sites:	5	
Totals:	540	\$ 216,000.00

Well Abandonment Costs:

Item	Hours	Cost
Move drill rig over well	6	\$ 2,400.00
Remove antifreeze from well	4	\$ 1,600.00
Mix and pump abandonment grout in well	8	\$ 3,200.00
Cement top 100' of well	2	\$ 800.00
Pack equipment	4	\$ 1,600.00
	24	\$ 9,600.00
Number of monitor well sites:	5	
Totals:	120	\$ 48,000.00

Number of 24-hour days for project: 56.5
Total drilling cost: \$ 542,400.00

Other costs

	Number of work days:	57		
Personnel transport				
Drill crew airfare	16	\$	2,500.00	\$ 40,000.00

Geologic-Hydrologic crew airfare	6	\$	2,500.00	\$	15,000.00
				\$	55,000.00

Drilling and Production equipment/supplies

Drill mud	384	\$	17.50	\$	6,720.00
Drill polymer	60	\$	200.00	\$	12,000.00
7 5/8" steel production pipe	1,250	\$	25.00	\$	31,250.00
7 5/8" steel surface casing	420	\$	25.00	\$	10,500.00
2.5" PVC casing	6,250	\$	5.00	\$	31,250.00
2.5" PVC screen	200	\$	10.00	\$	2,000.00
gravel pack	160	\$	20.00	\$	3,200.00
bentonite pellets	60	\$	50.00	\$	3,000.00
antifreeze (100%, will be cut with 50% water)	1,400	\$	15.50	\$	21,700.00
arctic cement for production casing	500	\$	50.00	\$	25,000.00
arctic cement for well abandonment	150	\$	50.00	\$	7,500.00
abandonment grout	700	\$	20.00	\$	14,000.00
				\$	168,120.00

Scientific equipment

transducers	6	\$	1,500.00	\$	9,000.00
submersible pump and cable	1	\$	20,000.00	\$	20,000.00
Tanks, boxes, meters	1	\$	5,000.00	\$	5,000.00
				\$	34,000.00

Other costs

Geophysical logging costs	1	\$	10,000.00	\$	10,000.00
Coal and gas analytical costs:	1	\$	5,000.00	\$	5,000.00
Formation permeability testing costs	1	\$	25,000.00	\$	25,000.00
Water quality testing costs	1	\$	5,000.00	\$	5,000.00
Miscellaneous equipment and supplies	1	\$	10,000.00	\$	10,000.00
				\$	55,000.00

Potential "in-kind" costs

Diesel Fuel	9,200	\$	5.00	\$	46,000.00
Heavy equipment rental	1	\$	20,000.00	\$	20,000.00
Vacuum truck rental, mud disposal	1	\$	20,000.00	\$	20,000.00

Pickup truck rental	2	\$	5,000.00	\$	10,000.00
Drill crew per-diem	452	\$	150.00	\$	67,800.00
Permitting	1	\$	10,000.00	\$	10,000.00
Geologic crew per-diem	170	\$	150.00	\$	25,425.00
				\$	199,225.00

Summary of costs

Air transport	240,000.00	\$
Exploration well	108,000.00	\$
Production well	170,400.00	\$
Monitor wells	216,000.00	\$
Well abandonment	48,000.00	\$
Personnel transport	55,000.00	\$
Drilling/Production equipment and supplies	168,120.00	\$
Scientific equipment	34,000.00	\$
Service/laboratory/analytical	55,000.00	\$
Potential "in-kind"	199,225.00	\$

Total \$ 1,293,745.00

Estimated project cost: \$ 1,293,745.00

USGS headquarter's assessment fee: \$ 176,419.77

Total estimated project cost: \$ 1,470,164.77

Department of the Interior in-kind services	2005-2007	2008
Salary/Benefits Clark: Project oversight	\$ 100,000.00	\$ 60,000.00
Drilling travel-field expenses: Clark	\$ 40,000.00	\$ 20,000.00
Salary/Benefits Maclean: Project oversight	\$ 100,000.00	\$ 60,000.00
Drilling travel-field expenses: Maclean	\$ 10,000.00	\$ 5,000.00
Salary/Benefits Barker: Project oversight-desorption	\$ 50,000.00	-
Drilling travel-field expenses: Barker	\$ 20,000.00	-
Salary/Benefits Roberts: drilling/testing	\$ 40,000.00	\$ 40,000.00
Drilling travel-field expenses: Roberts	\$ 10,000.00	\$ 10,000.00
Salary/Benefits Eman: Drilling services	\$ 50,000.00	\$ 30,000.00
Drilling travel-field expenses: Eman	\$ 10,000.00	-
Salary/Benefits Weeks: Permeability and Production Testing	\$ 10,000.00	\$ 50,000.00
Salary/Benefits Corum: Water Quality Testing	\$ 10,000.00	\$ 10,000.00
Project Preparation: Field work, community meetings etc.	\$ 50,000.00	\$ 10,000.00
Permitting costs:	\$ 10,000.00	\$ 10,000.00
Drilling equipment purchase costs (includes rig):	\$ 300,000.00	\$ 150,000.00
Other USGS drill equipment preparation and usage:	\$ 200,000.00	\$ 100,000.00
Geophysical logging equipment purchase costs:	\$ 70,000.00	-
Transport of equipment to North Slope:	\$ 100,000.00	\$ 50,000.00
Transport equipment to Wainwright	\$ 70,000.00	-
Total in-kind services:	\$ 1,250,000.00	\$ 605,000.00

EXHIBIT B

**Wainwright Coal Bed Methane Project
2008 Phase II**

Schedule of Values

Schedule of Values

US Geological Survey Wainwright Coalbed Methane Phase II 2008

A		B	Work Completed		E	F		G
Item		Scheduled Value	C	D	Stored Materials	Total C+D+E	% Complete	Balance
Item #	Description		Previous	Current				
	Air Transport of Equipment							
	Drill Rig	\$30,000						
	Drill Rig Mast/ assorted items	\$30,000						
	Drill Steel and Trailer	\$30,000						
	Casing, Antifreeze, Cement etc.	\$150,000						
	Drill Exploration Well							
	Unpack Equipment	\$19,200						
	General Site Preparation	\$9,600						
	Drill, Set, Cement casing to 70'	\$7,200						
	Drill 6 3/4 hole to 3,000' (no core)	\$48,000						
	Run Geophysical Logs	\$4,800						
	Abandon Well	\$9,600						
	Move Equip. to Production Site	\$9,600						
	Drill Central Production Well							
	General Site Preparation	\$9,600						
	Equipment Setup	\$4,800						
	Drill, Set, Cement 12" to 70'	\$7,200						
	Drill 12" hole to 1240'	\$28,800						

	Set & Cement 1240' of steel casing	\$9,600							
	Trip Steel Inside Casing & Drill	\$4,800							
	Develop Well for Testing	\$9,600							
	Set Pump, fill w/ antifreeze etc.	\$9,600							
	Step Drawdown & Recovery Testing	\$67,200							
	Pull Pump, Decommission Well	\$9,600							
	Pack & Clean Equipment	\$9,600							
	Drilling of Monitor Wells (5 Wells)								
	Site Prep/Equipment Setup	\$16,000							
	Drill, Set, Cement to 70'	\$36,000							
	Drill Rotary Hole to 1270'	\$72,000							
	Run Geophysical Logs	\$4,000							
	Set & Complete 2.5" Monitor Wells	\$48,000							
	Develop & Fill with Antifreeze	\$24,000							
	Pack & Move Equipment	\$16,000							
	Well Abandonment Costs (5 Wells)								
	Move Drill Rig Over Wells	\$12,000							
	Remove Antifreeze from Wells	\$8,000							
	Pump Abandonment Grout in Wells	\$16,000							
	Cement Top 100' of Wells	\$4,000							
	Pack Equipment	\$8,000							

EXHIBIT C

Wainwright Coal Bed Methane Project 2008 Phase II

Report Deliverables

REPORT DELIVERABLES

Wainwright Coal Bed Methane Project

- 1) Geologic assessment of CBM resource.
 - a) Maps of Coal Seams >5'
 - i) Structure
 - ii) Pay
- 2) Pressures and isotherms of coal seams >5'.
 - a) If isotherms from 2007 coal samples at 1250' is suspect, re-core seam for new isotherm
- 3) Detailed description of testing procedures and results.
 - a) Detailed well histories
 - b) Detailed testing procedure and results
- 4) Reservoir information to design a development plan for 30 years of community power generation fuel and community structural heating.
 - a) Number of wells and timing
 - i) Producers
 - ii) Water disposal wells
 - b) Production facilities required and budget estimate
 - c) Production forecasts of water and CBM
- 5) Identify zones of potential water disposal.
 - a) Water sample from water zone, if possible

Petroleum

FREE SUB

Drilling Super Fluids

+ROP in Unconventional, Mature Depleted, & Coalbed Methane. ARCFluids.com

The Ugly Truth: Oil & Gas

Why Oil's Prognosis Is Terminal & Where the Future Stands: New Report www.EnergyAndCapital.com/PeakOil

Oil & Gas Exploration

Coalbed Methane & Shale Gas Utiliz Directional & Coiled Tubing www.AcadianEnergy.com

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Vol. 12, No. 44

Providing coverage of Alaska and northern Canada's oil and gas industry

Week of Nov

Wainwright test well finds gas

Coalbed methane resource could provide long-term power for the Alaska village if extraction proves economically feasible

Alan Bailey

Petroleum News

A multi-year U.S. Department of the Interior Alaska Rural Energy Project which has been searching for coalbed methane near rural Alaska villages hit pay dirt in June and July when a test well at the Chukchi coast village of Wainwright found a significant gas resource in coal seams under the village.

Wainwright with a population of 500 to 600 depends on expensive diesel fuel for electricity generation — an ability to switch to natural gas as an energy source for the electricity power plant could represent a substantial economic benefit for the community. However, the results of the summer drilling are still preliminary in nature and it remains to be seen whether the production of coalbed methane at Wainwright is technically and economically viable, Art Clark, co-project leader of the DOI project, told the Arctic Energy Summit technical conference on Oct. 16.

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Coffee Expose

A shocking sec
co's don't want
know.
www.coffeefool.com

Oil Rig Jobs

Information on c
and employer
opportunities.
www.oil-rig-job.com



"But we are able to say that there is enough coalbed natural gas contained in sub-permafrost coal seams underlying Wainwright and vicinity to serve as an alternative energy source," Clark said.

Fort Yukon first

The project, led by the U.S. Bureau of Land Management and the U.S. Geological Survey, and involving at various times Alaska's Division of Geological and Geophysical Surveys and the U.S. Department of Energy, started out by drilling a coalbed methane test well in 2004 at Fort Yukon in Alaska's Interior.

That well encountered coal seams but did not find viable quantities of gas. In 2005 a well at Franklin Bluffs, just off the Haul Road in the central North Slope, tested the potential to drill for coalbed gas in an area of deep permafrost, prior to drilling in the less accessible Wainwright area.

The project team used a lightweight Atlas Copco CS 1000 rig for both the Fort Yukon and Franklin Bluffs drilling. And in August 2006 the team barged the rig and other drilling equipment from Prudhoe Bay to Wainwright, in preparation for drilling in the Chukchi Sea village during the following summer.

Arctic Slope Regional Corp., the North Slope Borough and Olgoonik Corp. (the Wainwright village corporation) were partners in the Wainwright drilling.

Locate coal

The primary objective of the drilling was to determine the number, thickness and depth of the coals directly under Wainwright — it was already clear from surface rock exposures, seismic data and a couple of oil exploration wells drilled 25 to 30 miles away that coal existed under the village, Clark said.

But it was particularly important to discover how much of that coal lay below the thick regional permafrost zone. Production of gas from the permafrost is unlikely to be feasible.

"Even if there was a large amount of gas-bearing coal in the permafrost, more than likely that would not really provide a viable resource," Clark said.

History
Repeats
Itself.

NABCO ALASKA
DRILLING, INC.
ARCTIC SLOPE REGIONAL CORP.



Drilling started in early June and reached a total depth of 1,613 feet. Continuous rock coring resulted in 95 percent core recovery below the surface casing, Clark said. That resulted in about 1,500 feet of core in about 250 boxes for geologic analysis of the subsurface.

And during the drilling, the well penetrated many coal seams.

"We penetrated 70 feet of net coal in 24 beds greater than or equal to 1 foot in thickness. There were numerous other thin coals," Clark said.

Took coal samples

The drilling team took from one to four 1-foot samples from each of the coal seams that were at least 1 foot thick, and then rapidly transferred the samples into sealed plastic canisters for measurement of the amount of gas desorbed from the coal.

"The quicker you can get it into your canister and start taking measurements, the less gas you actually lose, although once you make your calculations you do have ways to determine what that lost gas is," Clark said.

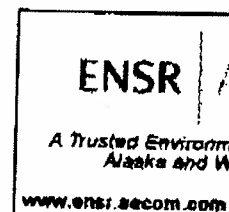
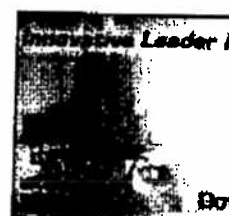
The team stored the canisters at a steady temperature in a desorption trailer and periodically measured the amount of gas released from each coal sample. Sampling intervals started at five to 10 minutes, but increased to once every few hours or more once the desorption rate slowed. At the end of the drilling project the samples were transported back to the USGS facility in Denver, for further monitoring and testing.

"Most of these samples are still desorbing back in Denver. It will take a long time for all of this gas to come off," Clark said. "... I'm taking readings approximately every 10 days now."

The team has also taken samples of the desorbed gas and gas from the drilling mud for chemical and isotopic analysis.

"We also (now) know that the gas contained in the coal is almost pure methane," Clark said.

Although the testing of the coal is still incomplete, preliminary results indicate a natural gas content of 50 standard cubic feet per ton from samples taken from a depth of 200 feet, increasing to 180 standard cubic feet per ton from the deepest coal sampled at 1,470 feet. There is



a very direct relationship between the depth of the sample and the amount of gas it contains, Clark said.

After completing the drilling and coring, the drilling team ran some geophysical logging tools down the well, using a portable winch system. The logs enabled identification of the exact depths and thicknesses of the coals, and of the other rock strata encountered.

Pressure recovery test

The next step involved isolating a single coal seam to test how quickly the pressure in the seam recovered from a pressure draw down — time and the project budget limited this type of testing to just one seam.

“Our coalbed of primary interest, our thickest coal, was at 1,250 feet,” Clark said. “We took four samples from that coal and they’re averaging out at a little over 150 standard cubic feet of gas per ton of coal.”

The team isolated this 7.5-foot seam by placing nitrogen-filled inflatable packers in the well above and below the seam, with a slotted pipe placed between the packers adjacent to the coal. A pipe through the upper packer connected the well hole within the seam to the surface. By using high-pressure air to drop the pressure in the pipe, the drill team could draw water from the coal seam to the surface. By then measuring the pressure recovery in the seam over a period of 12 hours, it was possible to calculate the permeability of the coal.

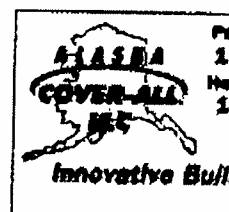
The permeability, a measure of how easily fluids can flow through the coal, turned out to be approximately 100 millidarcies, a value that Clark described as “a pretty nice, mid-range number” that ought to enable gas production without the need for artificial stimulation.

After completion of the draw down and recovery test, the team used a Teflon baler to recover a water sample from the coal seam for testing. A total dissolved solids reading of 10,000 to 12,000 milligrams per liter indicated that the water is highly brackish. That’s a mid-range dissolved solid content for a coalbed methane field but certainly not drinkable — water produced during gas production would likely have to be injected into a subsurface rock layer, Clark said.

From a technical perspective, one of the more intriguing discoveries from the well was the existence of numerous gas-bearing coal seams inside the permafrost zone (there have been questions in the past about



Integrated teams to manage and development projects



the existence of coalbed methane in permafrost).

"They did contain gas, somewhat surprisingly — they contained more gas than we thought they would," Clark said. "But that gas more than likely is not going to be producible."

Having completed the sampling and testing at the well, the team set an anti-freeze filled PVC well tube in the completed well for long-term monitoring of subsurface temperatures.

Estimated resource

So, what does all this mean in terms of a natural gas resource for Wainwright?

Just taking the single coal seam used for the draw down and recovery test, multiplying up the numbers for the coal volume and gas content indicates that there would be approximately 1.24 billion cubic feet of gas in one square mile of the seam. Assuming that 50 percent of that gas could in practice be recovered that amounts to 0.62 bcf of recoverable resource, Clark said.

"That is ... a very realistic and probably conservative recovery ratio," Clark said.

Currently Wainwright uses about 450,000 gallons of diesel fuel per year for electricity generation. The energy content of that volume of diesel equates to about the energy content of 62,500 thousand cubic feet of natural gas, thus indicating that one square mile of the single coal seam could fuel Wainwright electricity generation for 10 years, Clark said.

Taking the estimated gas content from all of the sampled sub-permafrost coal seams results in an estimate of a 26-year power supply from a total of 21 feet of coal. And extending the area of extraction to four square miles could provide power for the village for 40 to 100 years, depending on how many coal seams are tapped, Clark said.

Much work remains

But much work remains to be done before it will be possible to say whether coalbed methane production at Wainwright will be possible.

The project team has yet to determine the methane saturation of the

coals, a critical piece of data in determining how much water would have to be pumped out before taking gas out of the ground. But an initial assessment looks promising.

"Our initial feeling is that these coals are highly saturated, maybe even fully saturated, with respect to gas, which from a production standpoint is a very good thing," Clark said. However, actual saturation levels cannot be determined until isotherm analyses are conducted on fully desorbed coal samples. Because the coal cores are still desorbing, this won't be done for at least several more months.

The next step at Wainwright would be a multi-well production test, to test the engineering challenge of producing gas and water through the permafrost and to measure the characteristics of the coal seams as gas reservoirs. It would also be advisable to drill to a depth of 2,500-3,000 feet to look for possible deeper coal seams and to locate a potential zone for produced water disposal, Clark explained.

The multi-well test would require a larger truck-mounted drilling rig than the CS100 rig used for the test well.

"We need to transport a larger rig up to Wainwright," Clark said. "We have that rig in the Lower 48, which we can barge up and then fly into Wainwright in a C-130. ... We're already working with DOE trying to put together a multi-well test plan."

But the project team will need to work with the project partners to secure funding for all of that — current funding does not extend to production testing, Clark said.

However, the preliminary results from the Wainwright test drilling seem very promising and show that a lightweight rig can successfully test for shallow subsurface resources in a remote rural location.

"The 2007 Wainwright project shows that shallow to mid-depth test drilling to assess local-use resources can be successfully and economically conducted in remote Arctic locations using this type of portable equipment," Clark said. "... Similar equipment and techniques could be used for comparable studies in other frontier locations where little subsurface information is available."

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